# Computer Lab I

# Case Studies and BIOGEME

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# Outline

- Course website
- Organisation of the labs
- Case studies
  - Available datasets
- BIOGEME
  - Introduction and installation
  - Step-by-step example

# Course website

Website available at:

`http://transp-or.epfl.ch/courses/decisionAid2013/index.php`

Semester projects available at:

`http://transp-or.epfl.ch/studentProjects.php`

# Organisation of the labs

- Case Studies
  - Choose a dataset;
  - Test and interpret the example models;
  - Workbook: find results and possible interpretation of the examples.

- Material available at:
  `http://transp-or.epfl.ch/courses/decisionAid2013/labs.php`

# Organisation of the labs (cont.)

*Your lab participation*

- Form groups of 2 (maximum 3) and send an email with your group members to `evanthia.kazagli@epfl.ch` during the first week;
- Work jointly with your group on the exercises given out every week (e.g. exercise-session1.pdf);
- One assignment (following lab 2) to be handed in during the semester. To show what you have done, write a report (*one* per group) of *maximum 5 one-sided* pages and hand it in *by email* before March 8 at 12:00 pm. Your report should be in a `.pdf` format;
- Individual group feedback will be given during the next lab session.

# Case Studies

- Goal: Study models
- Datasets to apply and use the models in practice:
  - Netherlands mode choice
  - Optima (Mode choice in Switzerland)
- Problem statement

  Can the observed pattern of choice be explained in terms of basic economic variables, such as relative prices, income, and underlying individual characteristics (gender, age, etc.)?

# Datasets

- Netherlands mode choice

  Data on intercity travelers' choices between the transportation modes of rail and car.

- Optima

  Data on Swiss inhabitants' mode choice among public transportation, private and soft (walk, bike, etc) modes.

# BIOGEME

- Created by Michel Bierlaire;
- State of the art software for estimating models in the field of discrete choice;
- Open source;
- All models presented in this course can be estimated with BIOGEME;

# BIOGEME (cont.)

- Two versions are available for Windows:
  - GUI
  - DOS
- We recommend the DOS version.

# Today's lab

Lab 1

- Read the data descriptions available on the course webpage;
- Step-by-step example with BIOGEME using the Netherlands Mode Choice dataset.

# How to install Biogeme?

- `biogeme.exe` should be in `C:\Program Files`.
- Open a DOS window (from the Start menu, select Run. In the dialog box, type `cmd` and select OK).
- In order to use BIOGEME from any directory on your computer, the above directory has to be in your "path" (environment variable).
- Type `path=%path%;C:\Program Files\biogeme` (in the DOS window).
  - This has to be typed every time the DOS window in opened.
- To check if the installation has been successful, just type `biogeme` in the DOS window. A message displaying the version of BIOGEME should then appear.

# How to invoke Biogeme?

- BIOGEME is invoked in a DOS command window under Windows using the following statement structure:

```
biogeme model_file sample_file.dat
```

- 2 types of file: `.mod` & `.dat`
- The graphical version of Biogeme `guibiogeme.exe` (also available in `C:\Program Files\biogeme`) is invoked by a double-click on the executable file.

# DOS Command Window

Useful commands:

- To select a drive (e.g. `C`), just type `C:` at the prompt.
- To connect to a directory (e.g. `C:\biogeme`), just type `cd C:\biogeme`.
- To see the content of a directory, use Windows Explorer, or type `dir .`
- In order to return to the previous (top) directory, type `cd ..`

# On Mac OS X (and Linux)

Useful commands:

- To connect to a directory (e.g. `biogeme`), just type `cd biogeme`.
- To see the content of a directory type `ls`.
- In order to return to the previous (top) directory, type `cd ..`
- To know where you are, type `pwd` (print working directory)

# How does BIOGEME work?

- BIOGEME reads:
  - a file containing the model specification `model_file.mod`
  - a file containing the data `sample_file.dat`
  - Both are text documents (open with wordpad)
- `biogeme model_file sample_file.dat`
- BIOGEME automatically generates:
  - A file containing the results of the maximum likelihood estimation: `model_file.rep`.
  - The same file in HTML format: `model_file.html`.

# Example

- Netherlands mode choice
- Choice between rail and car
- 223 observations
- Travel times and travel costs are used as explanatory variables for the model, and the deterministic utility specifications are:

$$
\begin{aligned}
V_{\text{car}} &= \text{ASC}_{\text{car}} + \beta_{\text{cost}}\text{cost}_{\text{car}} + \beta_{\text{time}}\text{time}_{\text{car}} \\
V_{\text{rail}} &= \beta_{\text{cost}}\text{cost}_{\text{rail}} + \beta_{\text{time}}\text{time}_{\text{rail}}
\end{aligned}
$$

- The model is specified in `model_file.mod`

# Example (cont.)

Extract from the file containing the data `sample_file.dat`

| id | choice | cost_rail | time_rail | cost_car | time_car |
|---|---|---|---|---|---|
| 1 | 0 | 40 | 2.5 | 5 | 1.167 |
| 2 | 0 | 35 | 2.016 | 9 | 1.517 |
| 3 | 0 | 24 | 2.017 | 11.5 | 1.966 |
| 4 | 0 | 7.8 | 1.75 | 8.333 | 2 |
| 5 | 0 | 28 | 2.034 | 5 | 1.267 |
| | | | | | |
| 219 | 1 | 35 | 2.416 | 6.4 | 1.283 |
| 220 | 1 | 30 | 2.334 | 2.083 | 1.667 |
| 221 | 1 | 35.7 | 1.834 | 16.667 | 2.017 |
| 222 | 1 | 47 | 1.833 | 72 | 1.533 |
| 223 | 1 | 30 | 1.967 | 30 | 1.267 |

- 1 row = 1 observation
- 1 column = 1 variable

# Estimate your first model

- Download the two files from the course webpage to the directory of your choice (e.g. Desktop).
- In the DOS window, move to this directory using the `cd` command.
- Invoke BIOGEME:

```
biogeme model_file sample_file.dat
```

- Open the HTML file `model_file.html`.
- We briefly discuss it.